

WHAT IS CLAIMED IS:

1. A heating resistor type air flow rate measuring apparatus for measuring an air flow rate with a heating resistor installed in an air passage, wherein

5 a couple of heating resistors are installed in said air passage;

an air flow rate signal is output by correcting a difference value between an output signal of one heating resistor and an output signal of the other heating resistor  
10 onto a reference output signal obtained by a heating resistor as reference.

2. A heating resistor type air flow rate measuring apparatus according to claim 1, wherein said correction of an  
15 air flow rate signal is performed by multiplying a constant value or an variable constant determined in response to an air flow rate and a difference value between output signals of said two heating resistors.

20 3. A heating resistor type air flow rate measuring apparatus according to claim 1, wherein said two heating resistors are placed at closed positions where said two heating resistors interferes thermally with respect to air flow.

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4. A heating resistor type air flow rate measuring apparatus according to claim 1, wherein an output signal of a heating resistor placed at a upper stream of a air flow is used as said reference output signal of said heating resistor as reference.

5. A heating resistor type air flow rate measuring apparatus according to claim 1, wherein said two heating resistors include two independent drive circuits.

6. A heating resistor type air flow rate measuring apparatus according to claim 5, wherein output signals obtained by said two heating resistors are adjusted by a circuit so as to be identical to each other with respect to an air flow from a certain direction.

7. A heating resistor type air flow rate measuring apparatus in either one of claims 1 to 6, wherein

a heating resistor, a driving circuit associated with said heating resistor, a sub air passage in which said heating resistor is installed, and a connector part used as an interface to an outside are formed as a single module; and

a penetration hole connecting between an inside part and an outside part of a main air passage part composite member contains at least said sub air passage part in said

major air passage.

8. A heating resistor type air flow rate measuring apparatus having a couple of heating resistors interfering to each other thermally with respect to an air flow, each heating resistor including an independent drive circuit, wherein

an output signal of said each heating resistor is extracted by means that output signals obtained by said two heating resistors are adjusted by a circuit so as to be identical to each other with respect to an air flow running in a definite direction.

9. A heating resistor type air flow rate measuring apparatus according to claim 8, wherein an intake air flow rate signal is obtained by correcting a difference value between an output signal of one heating resistor and an output signal of the other heating resistor onto a reference output signal obtained by a heating resistor as reference.

10. A heating resistor type air flow rate measuring apparatus in either of claims 1 to 6, wherein

a heater generating heat independently on a air flow rate is inserted between a couple of heating resistors used for measuring an air flow rate; and

said couple of heating resistors are placed at

positions occupying an upper stream side and a down stream side with respect to an air flow.

11. A heating resistor type air flow rate measuring apparatus in either of claims 1 to 10, wherein a filter is mounted between an output part for an output signal and an input part for a air flow rate signal in a control unit for a fuel injection control.

12. A heating resistor type air flow rate measuring apparatus in either of claims 1 to 11, wherein a fuel injection control is performed in responsive to an output signal.

13. A heating resistor type air flow rate measuring apparatus in which a forward flow detection signal is detected from a heating current necessary to heat a forward flow heating resistor installed in an air passage to the predetermined temperature, and a backward flow detection signal is detected from a heating current necessary to heat a backward flow heating resistor installed in the air passage to the predetermined temperature, comprising;

a cancelling means for cancelling a differential mode noise including in each of the detection signals by adding the component of the alternating current of the backward flow

detection signal to the forward flow detection signal and adding the component of the alternating current of the forward flow detection signal to the backward flow detection signal.

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14. A heating resistor type air flow rate measuring apparatus provided with a pair of air flow rate detecting parts for detecting heating currents necessary to heat a forward and a backward flow heating resistor installed in an air passage to the predetermined temperature, respectively, as a forward flow detection signal and a backward flow detection signal, in order to output an air flow rate signal including a directional component of the air flow in the air passage by using each detection signal, further comprising:

15 a cancelling means for cancelling differential mode noises including in the forward and the backward detection signals by adding the component of the alternating current of the backward flow detection signal to the forward flow detection signal and adding the component of the alternating current of the forward flow detection signal to the backward flow detection signal, and outputting the forward and the backward flow cancellation signals;

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wherein an air flow rate signal is output by using the forward and the backward flow cancellation signals

instead of the forward and the backward flow detection signals.

15. A heating resistor type air flow rate measuring apparatus according to claim 13 or 14, wherein said  
5 cancelling means includes a signal comparing means for determining a direction of the air flow by the comparison of large and small of the forward and the backward flow detection signals, and a signal selecting means for selecting  
10 one of the forward and the backward flow cancellation output signals on the basis of the result of determination.

16. A heating resistor type air flow rate measuring apparatus according to claim 15, wherein said cancelling means, said signal comparing means and said signal selecting  
15 means is constructed so as to be included in a semiconductor electronic circuit of a fuel injection amount control unit for controlling the amount of fuel injection to an internal combustion engine by using the air flow rate signal.

20 17. A heating resistor type air flow rate measuring apparatus comprising:

a pair of air flow rate detecting parts for detecting heating currents necessary to heat a forward and a backward flow heating resistor installed in an air passage to the  
25 predetermined temperature, respectively, as a forward flow

detection signal and a backward flow detection signal,

a signal comparing means for determining the direction of the air flow in the air passage by the comparison of large and small of the forward and the backward flow detection signals,

a signal selecting means for selecting one of the forward and the backward flow detection signals on the basis of the result of determination, and

a differential amplifying circuit for switching and inputting the forward and the backward flow detection signals, adding an alternating current component of the backward flow detection signal to the input forward flow detection signal, and switching and outputting either one of an output signal higher than a reference voltage in proportion to the added signal and an output signal lower than the reference voltage in proportion to the input backward flow detection signal;

wherein an air flow rate signal including a directional component of the air flow is output by using the output signal from the differential amplifying circuit.

18. A heating resistor type air flow rate measuring apparatus comprising:

a pair of air flow rate detecting parts for detecting heating currents necessary to heat a forward and a backward

flow heating resistor installed in an air passage to the predetermined temperature, respectively, as a forward flow detection signal and a backward flow detection signal,

5 a signal comparing means for determining the direction of the air flow in the air passage by the comparison of large and small of the forward and the backward flow detection signals,

10 a signal selecting means for selecting one of the forward and the backward flow detection signals on the basis of the result of determination, and

15 a differential amplifying circuit for switching and inputting the forward and the backward flow detection signals, inverting the phase of an alternating current component of the forward flow detection signal and adding the resultant signal to the input backward flow detection signal, and switching and outputting either one of an output signal higher than a reference voltage in proportion to the forward flow detection signal and an output signal lower than the reference voltage in proportion to the added signal;

20 wherein an air flow rate signal including a directional component of the air flow is output by using the output signal from the differential amplifying circuit.

19. A fuel injection amount control system in which the



amount of fuel injection to an internal combustion engine is controlled by using the air flow signal obtained by the heating resistor type air flow rate measuring apparatus according to either one of claims 13 to 18.

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